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ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

Jennifer Lamb 1 K-25 Facility Records (Engr.)  
Requestor Document Center (is requested to provide the following document)

Date of request 1-22-96 Expected receipt of document \_\_\_\_\_

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Title and author (if document is unnumbered)

H.K. Ferguson — General Map S-50 Area  
Clinton Engineer Works Oak Ridge, Tenn.

(This section to be completed by Document Center)

Date request received 1/22/96

Date submitted to ADC 2/1/96

Date submitted to HSA Coordinator 2/1/96

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Date submitted to CICO 2/1/96

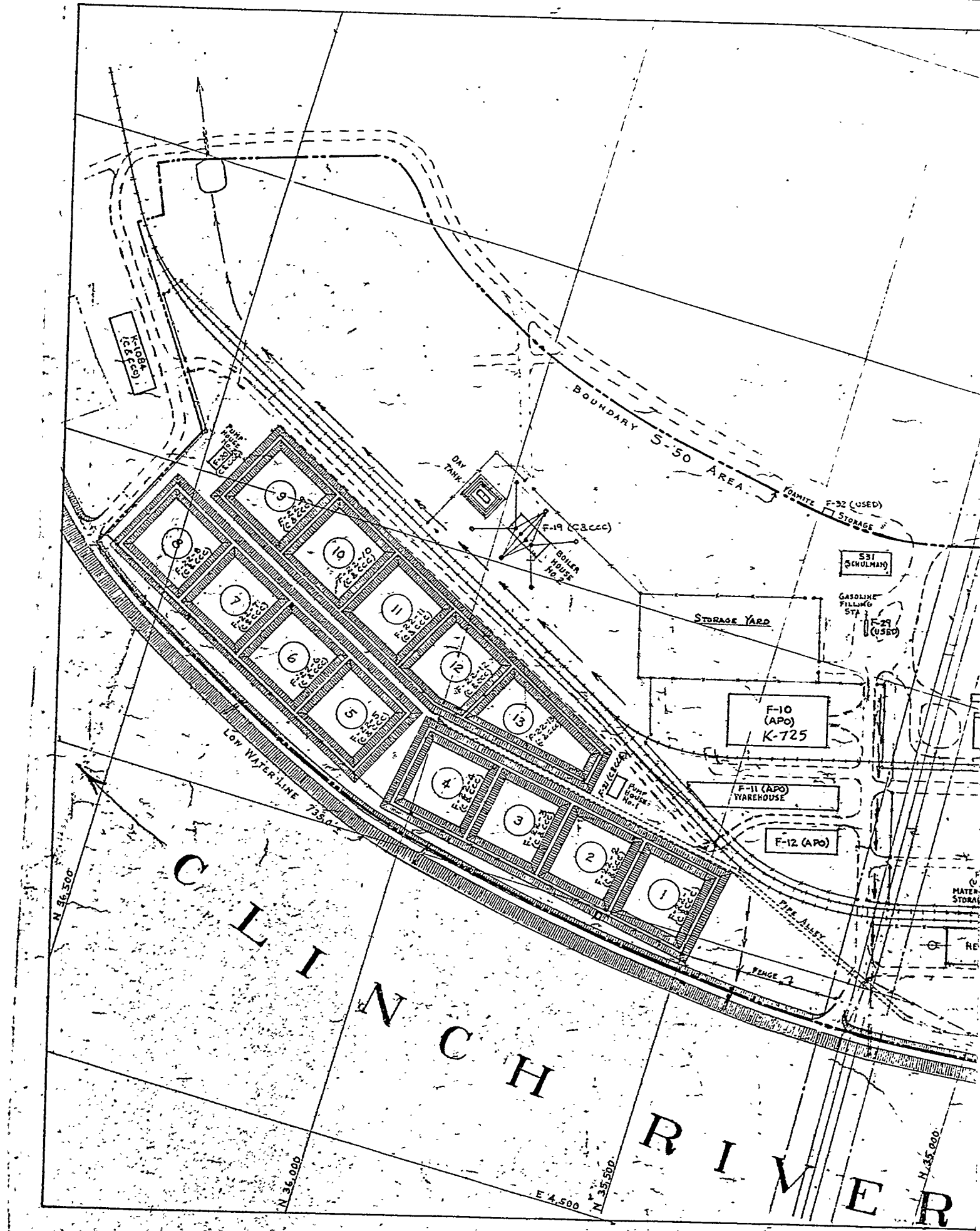
Date received from CICO 2/6/96

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Signature \_\_\_\_\_



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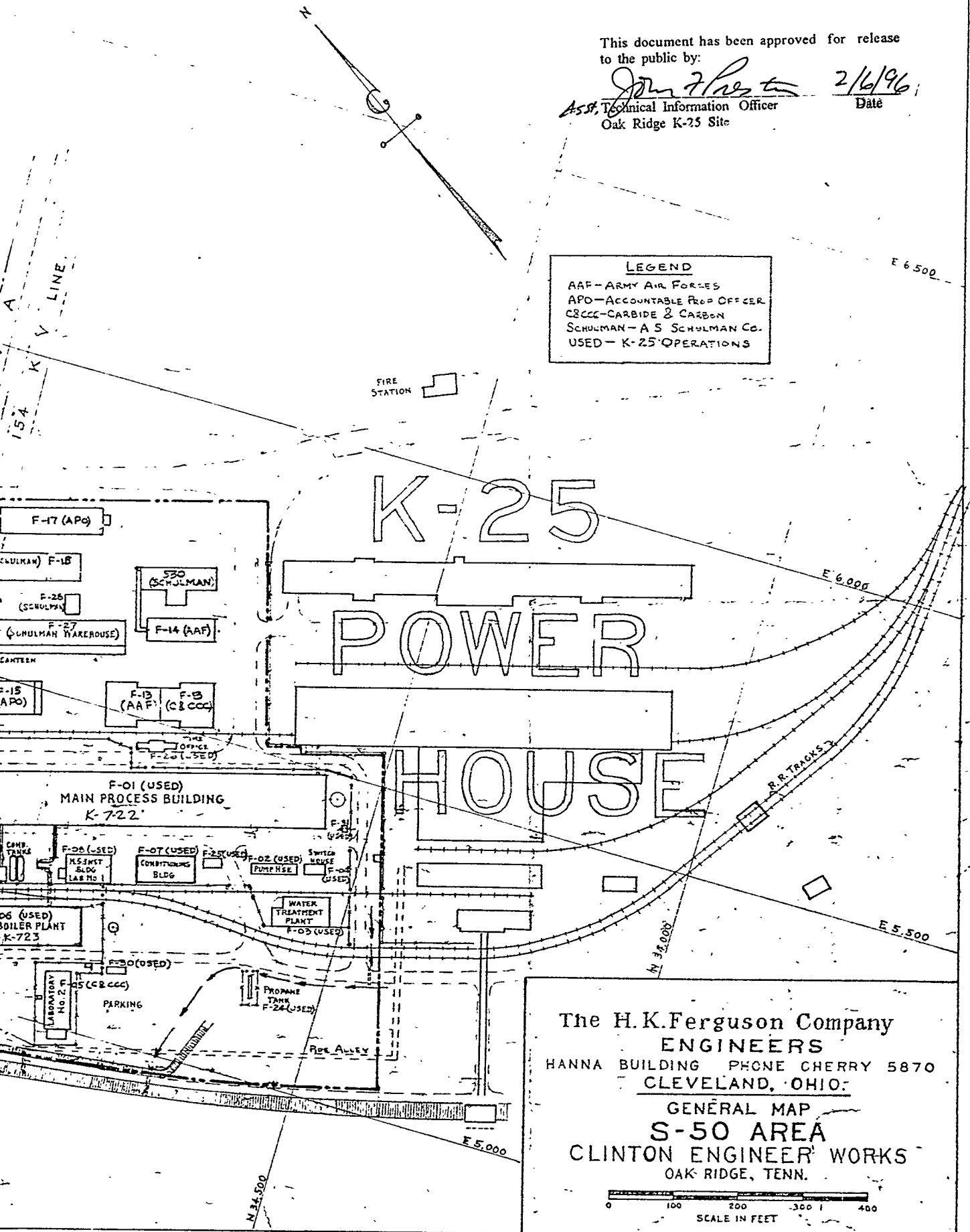
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*John F. Heston*  
Asst. Technical Information Officer  
Oak Ridge K-25 Site

2/6/96  
Date

LEGEND

AAF - ARMY AIR FORCES  
APO - ACCOUNTABLE PROP OFFICER  
C&C - CARBIDE & CARBON  
SCHULMAN - A S SCHULMAN CO.  
USED - K-25 OPERATIONS



The H.K.Ferguson Company  
ENGINEERS  
HANNA BUILDING PHONE CHERRY 5870  
CLEVELAND, OHIO.  
GENERAL MAP  
S-50 AREA  
CLINTON ENGINEER WORKS  
OAK RIDGE, TENN.

0 100 200 300 400  
SCALE IN FEET

2825

## ChemRisk/Shonka Research Associates, Inc., Document Request Form

**(This section to be completed by subcontractor requesting document)**

J. Lamb / 1034A  
 Requestor Document Center (is requested to provide the following document)

Date of request 9/14/95 Expected receipt of document 10/14/95

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REB<sup>e</sup>

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K/EM-338

**SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION  
PLANT QUARTERLY REPORT FIRST QUARTER FISCAL YEAR 1971  
(JULY 1 THRU SEPTEMBER 30, 1970)**

**(EXTRACTED FROM CRD DOCUMENT # K-1813)**

**Compiled by  
S. G. Thornton  
Environmental Management Division  
OAK RIDGE K-25 SITE  
for the Health Studies Agreement**

**December 21, 1995**

**Oak Ridge K-25 Site  
Oak Ridge, Tennessee 37831-7314  
managed by  
LOCKHEED MARTIN ENERGY SYSTEMS, INC.  
for the U.S. DEPARTMENT OF ENERGY  
under Contract DE-AC05-84OR21400**

This document has been approved for release

by the person by:

*[Signature]* /sgt 3/1/96  
Information Officer Date  
K-25 Site

**REB**

This document consists of 224 pages,  
No. 37 of 72 copies Series A.

DATE OF ISSUE: February 2, 1971

K-1813

PLANT RECORDS RECEIPT NO.
Q21384

**K25RC**  
NOT TO BE LOANED FROM  
PLANT RECORDS

K 1813 37 A



\*K 1813 37 A\*

OAK RIDGE GASEOUS DIFFUSION PLANT  
QUARTERLY REPORT (U)

FIRST QUARTER FISCAL YEAR 1971  
July 1, 1970 thru September 30, 1970

ADD classification assigned to CFI  
ADD signed *[Signature]* 11/22/75  
Date  
This upgrading is based on a single ADD report as auth-  
orized by DOE Office of Classification review of 6/16/94.

OAK RIDGE GASEOUS DIFFUSION PLANT  
Oak Ridge, Tennessee

RESTRICTED DATA: This document contains restricted  
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manner to an unauthorized person is prohibited.  
Exemption from automatic downgrading and  
classification

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C-9

TABLE C-8

CASCADE INVENTORY CHANGE  
(Kilograms)

	Fourth Quarter, FY 1970			
	Uranium-235		Xe	
	Ending Inventory	$\Delta$	Ending Inventory	$\Delta$
April	740.5	2.5	255.2	9.3
May	769.2	28.7	290.8	35.6
June	768.6	-0.7	291.3	0.5
Total		-30.5		45.4

	First Quarter, FY 1971			
	Uranium-235		Xe	
	Ending Inventory	$\Delta$	Inventory	$\Delta$
July	556.7	-211.9	201.5	-89.9
August	560.2	3.5	200.5	-1.0
September	720.8	160.7	255.7	55.2
Total		-47.7		-35.7

EFFICIENCIES AND PURGE RATES

Cascade Efficiency

Based upon the separative work concept, the cascade efficiencies for July, August, and September were 99.65%, 99.49%, and 99.76%, respectively, for a quarterly average efficiency of 99.63%.

On Stream Efficiency

The cascade onstream efficiency during the first quarter of fiscal year 1971 averaged 96.62%. Excluding off stream time attributable to the Plant Test Program and power control, the efficiency averaged 97.03%.

The quarterly efficiency for each of the cascade buildings averaged 96.51% for K-33, 99.13% for K-31, and 90.93% for K-29.

The major causes of offstream time are tabulated in Table C-9. The data are presented by months for the current quarter; totals are given for the current and previous quarter for comparison.

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TABLE C-9  
HOURS OFF STREAM

	<u>July</u>	<u>August</u>	<u>September</u>	<u>1st Qtr. FY 1971</u>	<u>4th Qtr. FY 1970</u>
Compressor Seal	108.96	104.82	62.57	276.35	103.37
Stage Motor	14.45	96.00	0	110.45	153.03
Stage Compressor	77.50	47.83	0	125.33	88.97
Instrumentation	0	0.33	0	0.33	0
Coolant System	3.08	0	0	3.08	4.22
Inleakage Checks	0	0	1.75	1.75	1.54
Treatment Operation	29.28	33.43	11.55	74.26	98.29
Power Control	8.91	0	0.28	9.19	0.33
Power Interruptions	42.48	1346.53	0	1389.01	0
Plant Test	85.32	439.87	326.98	852.17	0
Miscellaneous	226.16	14.98	12.33	253.47	169.08
Econ. Scheduling	987.52	1575.38	1482.63	4045.53	490.82
Total	1583.66	3659.17	1898.09	7140.92	1109.65

#### Purge Cascade

The average normal purge rate at K-311-1 during the first quarter was 7,031 scf per day. The highest monthly average during the quarter was in July when 7,216 scf per day was purged. The August and September rates were 7,112 and 6,765 scf per day, respectively.

#### Purge Cascade Testing

Several tests have been conducted in K-311-1 in order to determine more efficient methods of separating  $\text{ClF}_3$  and Freon from the cascade. The normal method of separation requires using building K-310-3 and several NaF traps in order to purge these gases. Using this method, only pounds of  $\text{ClF}_3$  per day can be purged from the cascade system.

Two new procedures have been tested for separating  $\text{ClF}_3$  by using K-311-1. The first method involves introducing air at the B-inlet of cell 10 in K-311-1. The flow containing  $\text{ClF}_3$  was routed from cell 9, a low-speed cell, to cell 6, a high-speed cell. (See Method 1 on Figure C-3. During testing, this method of separation increased the purge rate from 7,000 scfd to 50,000 scfd by diluting the mixture with dry air. The second method which was tested involves using dry air for the concentration recycle flow, and purging through the alumina traps to the atmosphere all the upflow from the booster pumps. (See Method 2 on Figure C-3).

This method produced a purge rate of 24,000 scfd. Normally, 7,000 scfd is routed through the trap and 17,000 scfd is recycled through the

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C-11

concentration recycle line to the low-speed cells. This involves recycling over two-thirds of the contaminants which then must be separated again. By using only air for the concentration recycle flow, all contaminants which have been separated can be purged from the cascade.

The bulb sample contained from less than 1 ppm to approximately 5 ppm of  $UF_6$ .

Methods of separating Freon are under study. One method which will be tested involves isolating cell 5 in K-311-1 and adding a known concentration of Freon and  $UF_6$  from building K-310-3. Sodium fluoride traps will be used, and the Freon from cell 5 will pass through the traps in an effort to purge the Freon from the system. If this method proves satisfactory, the Freon peak in K-311-1 will be located and a continuous slow bleed through the traps will be tested. Since all changes are considered temporary for testing purposes, they are being made parallel to existing systems so that normal operations can be resumed at any time.

During September, the cascade flow pattern in K-311-1 was revised from a side purge to a top purge type of configuration. At the current purge rate of 7,000 scfd, low-speed cell 5 and high-speed cell 8 are not needed; therefore, these cells have been shut down and bypassed. This results in a considerable cost saving.

#### BARRIER PERMEABILITY

#### Barrier Plugging Study

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TABLE C-17  
AUXILIARY PRODUCTION AND USAGE

	July	August	September	1st Quarter FY 1971	4th Quarter FY 1970	% Change
Nitrogen Production, Ft <sup>3</sup> Used at ORGDP	6,225,000	4,695,000	4,627,000	15,547,000	18,710,000	-16.91
To ORNL and Y-12	4,712,165	4,612,019	5,133,684	14,457,868	13,366,613	8.16
	1,051,944	0	0	1,051,944	5,223,146	-79.86
Hydrofluoric Acid Usage, Lbs.: Fluorine Production	962	0	720	1,682	1,984	-15.22
K-1420 Production:						
Starting Material, Lbs.	9,600	2,400	4,800	16,800	22,800	-26.32
Oxide from Calciners, Lbs. U	438	498	1,167*	2,103	2,298	-8.49
Metal Preparation	366	102	267	735	927	-20.71
Repackaged Enriched Oxide Shipped, Kg.	-	-	756	756	1,490	-49.26
Electroless Ni Plating, Mil Ft <sup>2</sup>	1,526	89	-**	1,615	3,611	-55.28
Electroplating Other, Mil Ft <sup>2</sup>	48	48	-	96	183	-47.54
K-1410 Tube Sheets	33	22	-	55	95	-42.11
Metal Anodized, Ft <sup>2</sup>	280	57	100	431	342	26.02
Metal Alodined, Ft <sup>2</sup>	156	77	3	236	1,483	-84.09
Black Oxide, Ft <sup>2</sup>	409	432	255	1,096	1,753	-37.48
K-1420 Recovery Operations:						
Uranium Solutions	544	621	280	1,445	1,941	-25.55
ORGDP, Liters	809	-	800	1,609	399	303.26
Y-12, Pounds						
Decontamination and Services:						
Compressors: K-29	4	-	-	4	2	100.00
K-31	5	2	4	11	7	57.14
K-33	2	1	1	4	2	100.00
Compressor Blades	-	1,040	-	1,040	-	-
Cylinders	78	39	71	188	249	-24.50
Decontamination Requests	24	26	3	53	39	35.90
Replenish Alumina Traps	13	31	6	50	92	-45.65
Classified Parts	698	778	865	2,341	1,932	21.17
Miscellaneous	550	621	444	1,615	2,813	-42.59

\* Includes 438 pounds of incinerator ash.

\*\* Facility shut down for repairs.

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## NUCLEAR MATERIALS MANAGEMENT

The nuclear materials management program is designed to exercise suitable controls over the movement of source and special nuclear materials. This involves surveillance of material balance experience by individual process and maintenance of necessary quality control systems for weights and analyses of samples.

### MATERIAL BALANCES

#### Cascade

The cascade material balance experience for July, August, and September is presented in Table C-18.

The hidden inventory for September indicated a gain of approximately 657 kilograms uranium and a loss of 11.6 kilograms uranium-235. Since the uranium-235 loss was considered to be abnormally high, and production data indicated output deficiencies, an additional inventory was taken on October 11, and efforts were made to locate a possible condensation. The October 11 inventory indicated a continuing loss trend. A condensation was subsequently located in the cell bypass piping of shutdown cells in units K-602-4 and -6.

TABLE C-18

#### CASCADE MATERIAL BALANCE SUMMARY (Kilograms)

First Quarter FY 1971	Uranium		Uranium-235	
	<u>Gain</u>	<u>Loss</u>	<u>Gain</u>	<u>Loss</u>
July	1,353	-	-	15.8
August	-	555	-	12.5
September	657	-	-	11.6

#### Cumulative Plant Account Efficiency

Estimated quantities of material representing the hidden inventory are shown by categories in Table C-19. The plant efficiency was 99.90% for Uranium and 99.80% for Uranium-235. Cumulative plant Uranium and Uranium-235 material balance data are shown in Figure C-4.

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C-24

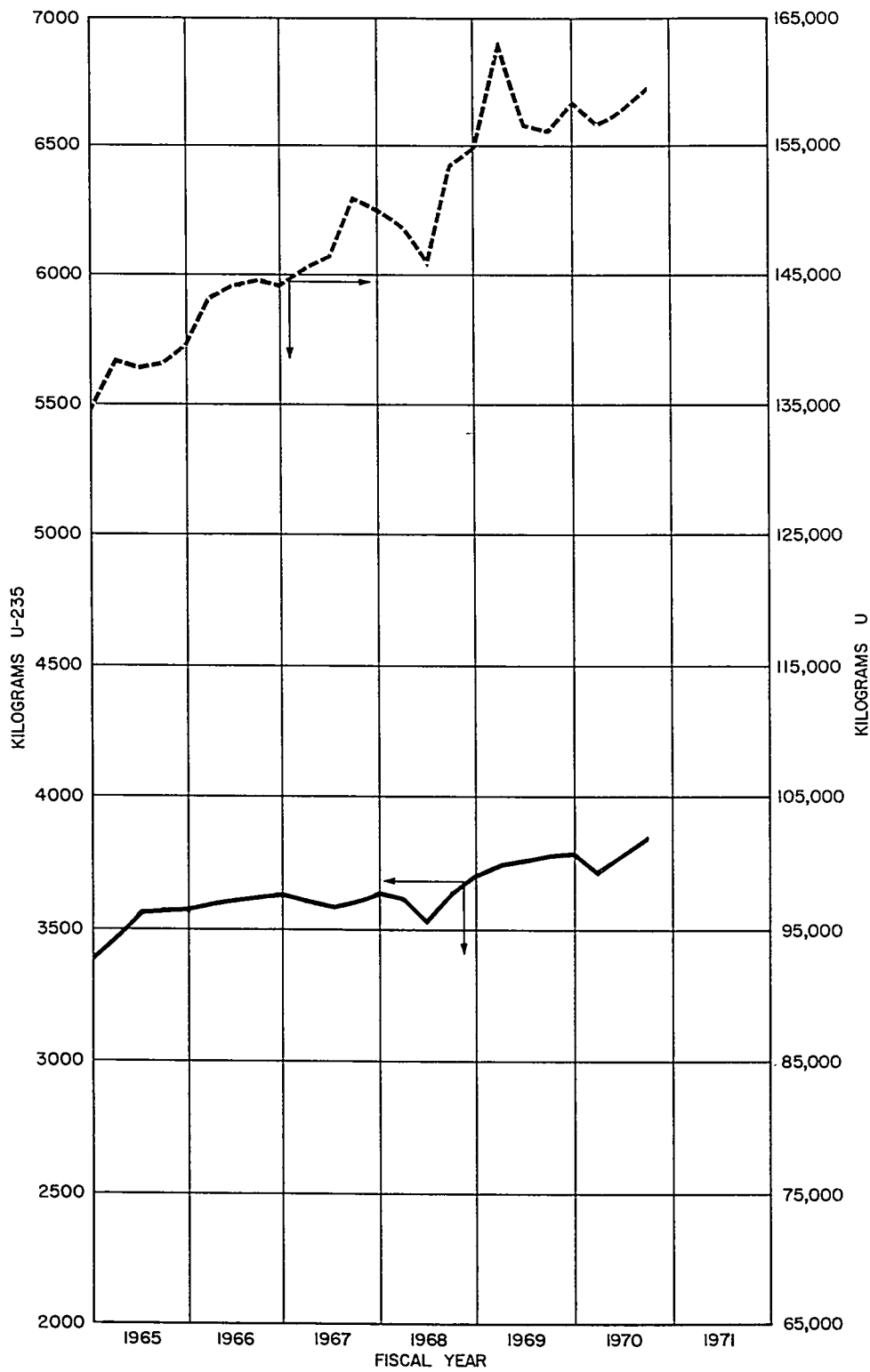


Figure C-4  
PLANT U AND U-235 DEFICIENCIES

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C-25

TABLE C-19

ACCOUNTING MEMORANDUM

Location of Deposit or Source of Hidden Inventory	Kilograms	
	Uranium	Uranium-235
Cascade:		
Inactive Consumption	12,905.4	1340.6
Active Chemisorption	665.7	55.0
Physical Absorption	631.1	7.2
Inactive Converters	93.1	2.9
K-1405 Holding Pond*	254.8	5.3
Uncredited Contamination on Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP - Paducah Interplant Cylinder (Heels)	-	-
Dilution before July 1955	-	179.2
Total	28,338.1	1,693.8

\* Includes 152.4 kilograms uranium and 2.5 kilograms uranium-235 removed in residue on October 26, 1961.

NUCLEAR MATERIALS HANDLING OPERATION

Responsibility of the material handling functions involves the weighing, sampling, and storage of major material quantities received at or shipped from the plant site, as well as internal material transfers. The material flows include both Commission and Licensee nuclear materials. Table C-20 is a summary of shipments for the Civilian Application Program requests. Material on hand awaiting shipment is shown in Table C-21.

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D-2

#### Sulfuric Acid Storage and Feed Tanks

Funds of \$37,000 have been authorized for this project.

The 18,000-gallon sulfuric acid storage tank and the associated piping and valves will be replaced. The walls of the new tank will be constructed of heavier material to extend its life expectancy. The tank will be relocated approximately 250 feet northward and will be provided with a dike to contain the maximum spill. Lighting and a safety shower will be provided.

UCC-ND personnel will perform the Titles I, II, and III Architect-Engineering services. A lump-sum subcontractor will furnish all other labor and material to complete the project.

#### Sprinkler Protection, K-33 Switchhouse

Funds of \$25,000 have been authorized for this project.

A fire water main on the west side of the K-33 Building will be used to supply the new heads. The existing fire protection system in the K-33 switchhouse will be removed from the recirculating water system and tied into the new source. This will involve the installation of approximately 175 feet of six-inch cast iron pipe as well as a post indicator valve. Two- and three-inch headers will be extended within the building to those locations where additional sprinkler heads are installed. The outside piping will be underground. The supports for the interior piping will also be provided.

UCC-ND personnel will perform the Titles I, II, and III Architect-Engineering services.

#### K-1423 Area Modifications

Funds of \$233,000 have been authorized for this project.

UCC-ND will perform the Titles I, II and III Architect-Engineering and furnish the labor and material to install the release control system so that the normal operation of the toll enrichment program will not be interrupted. A lump-sum subcontractor will furnish all other labor and material to construct the storage area and the parking lot.

#### Oil Piping, K-31 Switchyard

Funds of \$30,000 have been authorized for this project.

Two 2-1/2-inch steel lines (oil supply and return) will be installed across the switchyard, extending from the oil house to 24 feet south of the last steel tower, a distance of approximately 375 feet. Tee connections will be provided at convenient locations for connecting flexible hose to the oil circuit breakers and transformers. Bypass valves will be provided for line flushing. A 12-inch by 12-inch concrete trench with bar grating cover plates will be installed flush with the yard surface to contain the oil

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D-3

lines. French drains will be provided every 50 feet. The existing oil filter press, located in the pumphouse, will be replaced with an enclosed Cuno filter and pump unit.

UCC-ND will perform the Titles I, II and III Architect-Engineering, furnish the new filter equipment and complete the electrical tie-ins. A lump-sum subcontractor will furnish all other labor and material to complete the project.

#### 10- and 14-Ton UF<sub>6</sub> Cylinder Withdrawal

Funds of \$14,500 have been authorized for this project.

A reinforced concrete pit will be installed in an existing room on the east side of the K-413 Building. The 39,000-pound capacity Toledo scale, presently at K-631, will be relocated to the new pit. A new 13-foot wide by 14-foot high motor-operated roll-up door will be installed in the east wall for access to the scale with the straddle buggy. The existing west door will be enlarged for the installation of a 13-foot by 14-foot motor-operated roll-up door.

UCC-ND personnel will perform the Titles I, II and III Architect-Engineering services, procure the two motor-operated roll-up doors, and install and calibrate the relocated pit scales. A lump-sum subcontractor will perform the remaining work.

#### Telemetry Cable from Elza to "C" Gas Station

Funds of \$16,000 have been authorized for this project.

A 12-pair, No. 19 AWG, plastic-jacketed, Figure 8 construction telemetry cable from Elza Substation to the Gas Station "C", approximately 14,000 feet, will be installed. This cable, routed on existing power poles from the "C" Gas Station to the Y-12 area and connected to an existing Elza-ORGDP cable at the Elza Substation, will replace the existing lead-covered cable from Gas Station "C" to Gas Station "B" which is approximately six miles long.

UCC-ND personnel will perform the Titles I, II and III Architect-Engineering services and make the final tie-ins. A lump-sum subcontractor will accomplish the remaining work.

The following projects are complete:

Modifications of Uranium Sampling and Transfer Facility; Lighting Modifications, K-1400 Building; Electromechanical Laboratory; Sanitary Water Supply, K-31/K-33; Scales Standards Facility, K-1035; Building K-1050; K-31/33 Cooling Tower Flood Lighting; K-1036 Electrical Substation; New Fire Water Mains, Powerhouse Area; Rearrangements of Operations Division Office; Reroof K-1036.

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## INDUSTRIAL RELATIONS

*Section E concerns Safety and Health, Security, and Industrial Relations functions. Included are environmental testing and control, emergency training activities, grievance and arbitration cases, and a personnel recapitulation.*

### SAFETY AND HEALTH

#### SAFETY

##### Injury Experience

One disabling injury was experienced during the quarter. Fifteen serious injuries were recorded, with a resulting frequency rate of 11.82 as compared to eight serious injuries and a frequency rate of 6.10 during the previous quarter.

##### Property Damage Accidents

Three incidents resulting in property damage were experienced during the quarter, with an associated loss of \$720, as compared with eleven incidents and \$1762 loss during the previous quarter.

##### Material Releases

The one UF<sub>6</sub> release reported during the quarter was promptly controlled by the local operators. No personnel injury occurred.

##### Safety Improvements

Significant safety improvements included:

1. The noise levels to which the K-1101 operators are subjected have been greatly reduced by construction of a field office from which the operating panels are plainly visible.
2. The driveway just inside the roll-up door at the K-1401 Compressor Shop has been resurfaced, eliminating a 4-inch rise which was potentially dangerous for forklifts carrying loads into this area.
3. Guards have been installed under the fluorescent lights in the K-1401 Sheet Metal Shop office to prevent tubes from falling and possibly injuring an employee.
4. A sign, *Watch for Vehicle Traffic*, was posted at the crosswalk for Portal #2 where vision between drivers and pedestrians leaving the plant is blocked by the portal.
5. Identifying nameplates were installed on the pendant control for the over-head cranes in K-1401, more clearly designating the location of the main switch to be de-energized in case of an emergency.

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E-2

6. The hoist brakes on the Whiting Cranes in K-1401 were originally equipped with a bolt and cotter pin arrangement on the brake shoe. The cotter pin rubbing against the brake shoe would wear into, and the pin would vibrate loose causing the brake to fail. The pins have been replaced with a bolt, nut and cotter pin arrangement, thereby eliminating the wear on the cotter pin and creating a fail-proof brake.

#### Electrical Audits

Audits of electrical installations associated with new facilities and major alterations of existing facilities indicated general compliance with specifications and code requirements. Ninety-five percent of the 172 items checked were satisfactory.

#### Promotion and Education

The second disabling injury experienced this year occurred during the quarter at which time employees had worked 1,110,648 safe hours, which is the fourth disabling injury-free period exceeding one million hours this year.

During the quarter, an oral paper was presented to the Kentucky Chapter of the Health Physics Society by an employee of this department. A department representative participated in an exchange of Safety and Health Physics information between AEC contractors at a meeting in Paducah, Kentucky, and another attended a three-day Industrial Health Physics Conference in Gatlinburg, Tennessee.

An effective medium for reaching a broad spectrum of plant management is the Thursday morning tape session in which topical information of plant-wide interest is presented. Safety messages presented included re-emphasis on the value of wearing seat belts, advocacy of careful driver attention in school areas, publicity of the plant's involvement in fire prevention activities.

A letter from the Plant Superintendent, citing an increase in the number of hand injuries, requested that during August and September added emphasis be directed toward the protection of employees' hands. Appropriate informational material, including a 16-mm color movie titled *On Every Hand*, was provided by the Safety staff for use in this effort.

The need for hearing conservation was again re-emphasized with plant areas of concern posted with signs specifying control measures to be observed. A series of three informational bulletins was also issued covering hearing protection devices, as well as questions and answers about noise and related health and safety procedures. A color slide and tape program titled *It's Your Hearing*, which advocates the appropriate use of hearing devices, was widely used in safety meetings. Also shown extensively was color slide and tape narrated program relating to the prevention of falls.

Routine safety emphasis was continued through such media as safety billboards and the *Nuclear Division News*. The latter medium was used to acquaint employees with measures being taken in the area of hearing conservation. Boating safety and eye safety were also stressed.

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E-3

Both the number of Safety Meetings and attendance remain at a high level with 262 Safety Meetings recorded with 3,880 employees in attendance.

#### MECHANICAL SAFETY

The number of inspections and tests conducted and the percentages of satisfactory units continued at about the same level as in previous quarters. (Table E-1).

The previous report<sup>1</sup> mentioned failure of the upper sheave support assembly on the 20-ton crane in K-1131, along with fabrication and installation of a temporary replacement. During this period, a permanent support assembly of improved design was fabricated, installed, and tested at 125% of the crane rating. During the repair outage, two of the four trolley wheels were found to contain circumferential cracks. New wheels were promptly obtained and installed.

Three new jib crane installations were inspected. Two were satisfactory but the other installation had to be reenforced by the addition of braces and the column on which it was attached, had to be boxed in to eliminate twist. After these improvements, satisfactory operation, under a 125% load test, was obtained.

During inspections and hydrostatic tests of 13 compressor-mounted air receivers on dry-pipe sprinkler systems, the shell of the air receiver in K-303-6 was found to be cracked adjacent to one of the four welded support attachments. A replacement receiver was obtained and installed.

A caustic transport tank was found to be inadequately anchored to the lowboy on which it is hauled. Anchoring improvements were promptly made, and an engineering evaluation to determine the adequacy of the anchoring method will be made.

Twelve new 2 1/2-ton Westinghouse UF<sub>6</sub> cylinders were returned to them because the cylinders did not contain valve couplings, the valves had been threaded into the head plates. Westinghouse had couplings installed by the cylinder manufacturer but the cylinders were still not acceptable for filling because the couplings and threads were inferior, which resulted in leakage past the valve threads. Westinghouse again returned the cylinders to the manufacturer for installation of the specified 6000-lb valve couplings.

During inspection and tests of pressure relief devices, one stop valve below a relief valve was found closed and one of the four relief valves on the steam side of the K-1131 autoclave relieved at 13 psig instead of the desired setting of 10 psig. Three blown rupture discs were replaced.

<sup>1</sup> Oak Ridge Gaseous Diffusion Plant Quarterly Report, Fourth Quarter Fiscal Year 1970, April 1970 through June 1970, Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant

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E-4

A 10,000-gallon hydrochloric acid storage tank developed leakage after only 3 years of service. The acid was transferred into a tank car which will be used until the storage tank can be repaired or replaced. Internal examination of the tank showed that the Koroseal lining was loose or bagging in several areas.

TABLE E-1  
MECHANICAL SAFETY INSPECTIONS AND TESTS

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1970<sup>a</sup></u>	<u>1965 1969<sup>a</sup></u>
<u>PRESSURE RELIEVING DEVICES</u>				
Number Tested, Repaired, or Replaced	381	455	469	448
Number Satisfactory (b)	380	452	467	440
Percent Satisfactory	99.7	99.3	99.5	98.2
<u>BOILERS AND PRESSURE VESSELS</u>				
Number Inspected or Tested	229	253	247	226
Number Satisfactory (b)	214	248	230	212
Percent Satisfactory	93.4	98.0	93.0	93.8
<u>HOISTING EQUIPMENT</u>				
Number Inspected or Tested	459	294	380	406
Number Satisfactory (b)	402	232	314	343
Percent Satisfactory	87.6	78.9	82.5	84.5
<u>SLINGS &amp; LIFTING FIXTURES</u>				
Number Inspected	480	828	720	536
Number Satisfactory (b)	450	795	687	515
Percent Satisfactory	93.8	91.0	95.5	96.1
<u>COMPRESSED GAS &amp; UF<sub>6</sub> CYLINDERS</u>				
Number Tested	394	374	318	318
Number Satisfactory (b)	371	356	308	311
Percent Satisfactory	94.2	95.2	96.9	97.8
<u>OXY-ACETYLENE WELDING &amp; CUTTING EQUIPMENT</u>				
Number Tested	17	12	16	19
Number Satisfactory (b)	12	7	12	14
Percent Satisfactory	70.6	58.3	75.0	73.7

(a) Quarterly Averages.

(b) Includes those with minor defects not affecting safe operation.

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## NUCLEAR SAFETY AND TECHNOLOGY

### DOT Special Permit

Department of Transportation special permit No. 6273 was issued to Union Carbide Corporation, Nuclear Division, on August 14, 1970, covering shipments of nominally empty 5-, 8-, 12-, and 30-in. UF<sub>6</sub> product cylinders without protective overpack. These cylinders contain small amounts of residual UF<sub>6</sub> *heels*, as given in ORO-651, Rev. 2. The 48-in. cylinder was not included in the permit at this time.

### Nuclear Safety Approvals

Nuclear safety approvals were issued for shipment of material to National Lead of Ohio and for the transfer of tower ash from Y-12 back to K-1420 where it will be repackaged for shipment to NLO. Also, consideration was given to the transfer of uranium metal units from their present storage location on the K-306 section operating floor to the K-312 section operating floor. New code calculations have indicated that a 25% improvement can be made in utilizing the available floor space and still provide adequate safe access to individual storage positions. All units will again be securely fastened to the floor in a safe slab array.

A new storage area was established in Vault 8A for incoming 30-in. *heel* cylinders.

A review of the K-1005 Special Equipment Test Facility was made at the request of the Separation Systems Division.

### Pipe Connection for 5.0% Criticality Experiment

An 11.00-in.-ID 30° aluminum lateral was constructed in the K-25 Fabrication Shop and sent to the Critical Experiments Facility (9213) for tests with 5.0% <sup>235</sup>U enriched uranyl fluoride solutions. All butt welds were liquid-penetrant inspected, and there were no indications of open defects on outside surfaces of the welds. A 2-psig pneumatic soap test gave no indication of leakage. A special package support was made by the Carpenter Shop to guard the thin-wall unit against damage in movement and to permit rolling it for Heresite protective coating treatment.

A volume calibration showed the average diameter of the lateral varied from 11.000 to 10.984 in. The purpose of the experiments is to provide a basis for equipment design at enrichments to 5.0%. A number of critical experiments have been conducted to date; the results will be reported by the Critical Experiments Facility.

### Safeguards Planning

Department personnel participated in discussions regarding the development of projects directed toward the advancement of technologies applicable to the safeguarding of nuclear materials.

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### Protective Packaging

Tests of two shipping containers for small UF<sub>6</sub> cylinders appear promising with phenolic-resin insulation. Outside dimensions of the prototype shipping containers are 15-1/4 in. ID x 23 in. Puncture and drop tests made on one of these containers resulted in indentation of the 24-gage steel sidewalk and a small portion of the gasketed lid. Template indicators packed in the 5-1/2 in. diam x 14 in. cavities of both containers attained a maximum temperature of 200°F during the 1/2 hour, 1475°F thermal test.

Engineering design changes for the 30-in.-ID UF<sub>6</sub> cylinder protective structural package, which include shackle relocation, support framework for end handling by fork lift, roll bar protection against cables, and reinforced leg supports, have been completed. A new silicone rubber gasket material is being evaluated as a possible replacement for the vinyl foam gasketing now used for the 30-in. cylinder overpack.

### HEALTH

#### Medical Activities

The medical case load increased by twenty percent over that of the previous quarter, with the larger number reflecting the emphasis toward the annual influenza immunization of the plant population. The detailed breakdown by case type is shown in Table E-2

TABLE E-2  
MEDICAL CASE LOAD

<u>Type of Case</u>	<u>This Quarter</u>	<u>Last Quarter</u>
Industrial Injuries & Illnesses	919	835
Nonindustrial Injuries & Illnesses	1,890	1,825
Pre-employment and Rehire Examinations	195	164
Pre-employment Rejects*	1	0
Terminations	81	41
Periodic Examinations	166	211
Interim Examinations	57	137
Industrial Health Examinations	20	58
Optometric Visits	456	477
Returns to Work, Recalls & Miscellaneous	2,772	1,819
Total Case Load	6,556	5,567
Services to Outside Parties (included in Case Load)	64	17
Laboratory Procedures Completed	6,464	6,603
Electrocardiograms	342	276
X-rays	934	824

\* Included in Pre-employments and Rehire Examinations

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### Personnel Radiation Monitoring

The average film badge exposure of sixteen mRem for the 107 persons monitored quarterly compares favorably with the low values reported for recent years. The maximum exposure to a single individual in the plant population considered to have some potential exposure to penetrating radiation approximated six percent of the radiation protection guide of 3,000 mRem/quarter.

Similarly, random sampling of the general plant population not normally considered to be *at risk* was continued on a quarterly schedule. These results revealed no personnel exposure to penetrating radiation of as much as ten percent of the quarterly guide values.

Analyses of 326 urine specimens for uranium mass and alpha activity this period revealed three instances of exposure that exceeded the radiation protection guide for a single sample and were recalled for follow-up urinalysis. The uranium excretion rates promptly returned to a level below the radiation protection guide.

### Industrial Health Examinations and Clinical Urinalysis

Ten chest and/or sinus X-rays were made on the nine employees scheduled for industrial health examinations. No findings of clinical significance were discovered. Thirty employees on the routine programs submitted urine specimens for chemical analysis at the field collection stations. None of the thirty laboratory tests indicated results above the threshold limit value for the material of concern.

### Plant Toxicants

In addition to field monitoring by the operating departments, staff personnel collected 37 samples for airborne contaminants, with none exceeding the concentration guides.

The concentrations of fluorides in the atmosphere, of special interest in the operation of gaseous diffusion cascades, have been monitored since February at several locations in the vicinity of the ORGDP. At distances of approximately one mile and beyond, in various compass directions, the fluoride concentrations have averaged less than the most restrictive value under consideration by regulatory agencies.

### Radiation Source

No new radioactive sources were registered during the period, and routine checks of the fifteen radium sources at ORGDP revealed no radon leakage.

### Airborne Uranium Alpha Activity

The average alpha activity levels reflected by the 1,996 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low,

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representing less than ten percent of the radiation concentration guide of  $10^{-10}$   $\mu\text{Ci/cc}$  uranium in air. The 945 shift-length air samples taken at five outdoor locations around the plant perimeter reflected an average gross alpha activity downwind from major stack discharges of approximately four percent of the radiation concentration guide for a forty-hour occupational exposure period.

#### Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from the installation upstream. Analyses of the Clinch River samples at CRM-14.5 (ORGDP Sanitary Water Treatment Plant raw water intake), performed by ORNL for their control purposes, are also being used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guide values, and the thirteen-week average in plant potable water supply continues to be less than ten percent of the maximum permissible concentration in water for the mixture of radionuclides involved.

#### Water Pollutants

The average uranium concentration in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all of the Oak Ridge Operations, remained less than 0.1 percent of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

### EMPLOYEE AND LABOR RELATIONS

#### Arbitration

Of the five grievances pending in arbitration on June 30, 1970, three were withdrawn and one, LRG 18-K, was heard in arbitration. Grievance LRG-18-K involved a dispute over the Company's refusal to pay for an extra day of vacation taken by a Machinist. The Union's position was that the Company was responsible for the error and asked that the aggrieved be compensated for his losses. The case was heard on July 15 by Arbitrator Robert H. Moore. In his award of August 31, Mr. Moore sustained the Company's position, pointing out that the aggrieved knew or should have known that he was not entitled to this day of vacation.

One grievance, LRG 38-K, appealed to arbitration on May 27 is still pending. An arbitrator has not been selected.

Two grievances were appealed to arbitration in the quarter as follows:

September 1 (LRG 64-K) Instrument Mechanics protest the assignment of work to Maintenance Mechanics. They request eight hours' pay for the two *call-ins* which they allege they failed to get as a result of this assignment.

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September 29 (LRG 69-K) Firemen protest changes made in the telephone answering arrangements in the Fire Department. They contend that this transfers part of the responsibility of the Firemen to the Shift Superintendent and is contrary to a long-established practice. They request that this responsibility be returned to the Firemen.

At the close of the quarter, three grievances are pending in arbitration.

Union Dues - OCAW

On August 11, the Oil, Chemical and Atomic Workers International Union, Local 3-288, notified the Company by letter that beginning with September, membership dues would be increased to \$7.00 per month.

Craft Severance - Machinists (NLRB Case No. 10-RC-8363)

Under date of August 6, 1970, the International Association of Tool Craftsmen and its Local No. 20, N.F.I.U., Rock Island, Illinois, filed a petition with the Regional Director, Region 10, National Labor Relations Board, requesting certification as representative of "all machinists first class, machinists second class, machinists trainees, machinists trainee helpers and instrument makers in the employer's machine shop in Building K-1401 at its K-25 Plant, Oak Ridge, Tennessee". The employees described in this unit are presently covered by the existing collective bargaining agreement between the Company and the Oil, Chemical and Atomic Workers International Union, AFL-CIO, and its Local No. 3-288.

A motion to intervene on behalf of the Oil, Chemical and Atomic Workers International Union has been filed with the Regional Director by E. C. Clevenger, President, Local 3-288. The Company has also filed a position statement and request for dismissal of the petition through Mr. William C. Treanor, Attorney for Union Carbide Corporation, New York, New York.

SECURITY

General

Classified facilities have been established for an ORGDP security interest at the following companies and locations:

AA Gage Division, U. S. Industries, Ferndale, Michigan  
W. F. and John Barnes Company, Rockford, Illinois  
Ex-Cell-O Corporation, Oak Park, Michigan  
Giddings and Lewis-Bickford Machine Company, Kaukauna,  
Wisconsin  
National Automatic Tool Company, Richmond, Indiana  
Moline Tool Company, Moline, Illinois  
Zagar, Inc., Cleveland, Ohio

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The ORGDP security interest with the following companies was terminated during the quarter:

AiResearch, Torrance, California  
Taylor Forge, Bellwood, Illinois

#### Personnel Clearances

A total of 99 clearance requests was processed for prospective new employees and transferees. Of these, 77 were for individuals not cleared before, 15 were for transferees, and 7 were reactivated. At the end of the quarter, there were 70 "Q" clearances for prospective new hires pending.

One hundred and ninety-seven clearance requests for subcontractor, construction and vendor personnel were processed as follows: 77 "Q" clearance extensions were requested, 23 "Q" clearances processed, 30 "L" clearances extended, and 67 "L" clearances processed.

#### Visitor Control

A total of 2,731 visits was arranged during the the quarter. A breakdown reflects that there were 534 outgoing and 1,057 incoming classified visits and 974 incoming unclassified visits.

#### Security Education

An initial security briefing was presented to 58 new hires and transferees. A comprehensive security briefing was presented to 34 employee and technical consultants this quarter. Two hundred and twenty-eight employees attended a briefing on a revised classified mail handling procedure.

#### Classified Shipments

A total of 17 classified shipments (15 outbound and 2 inbound) was audited this quarter.

#### Emergency Activities

Fire Fighting	250-1/2 man-hours
First Aid	72 man-hours
Masks & Suits	85 man-hours
Rescue	37 man-hours

Four drills included combating fires in a remote building attic and on an inactive K-25 cooling tower. A leaking gasoline tank truck fire and a burning oil storage tank were also the subject of drills.

#### Fire Protection

During the quarter, the Fire Department responded to alarms for seven fires and eight requests for service. There was no monetary loss for fires.

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TABLE E-3

FORCE REPORT

	Current Quarter	Previous Quarter	1969 <sup>a</sup>	1968 <sup>a</sup>	1964 1968 <sup>a</sup>
Type of Personnel					
Production	323	327	323	315	312
Fab. & Maintenance	1077	1079	1043	981	974
Lab. & Dev.	465	473	460	424	378
Staff Services & Others	863	918	916	934	879
Total	2728	2797	2742	2654	2543
Type of Payroll					
Hourly	1068	1080	1071	1050	1063
Weekly	793	822	816	804	736
Monthly	867	895	855	800	744
Sex					
Males	2300	2357	2315	2234	2158
Females	428	440	428	421	384

a Quarterly Average

TABLE E-4

LABOR TURNOVER

	Current Quarter	Previous Quarter	1969 <sup>a</sup>	1968 <sup>a</sup>	1964 1968 <sup>a</sup>
Labor Turnover Percent	3.08	1.69	2.18	1.95	2.00
Reason for Termination					
Resigned	68	28	46	34	30
Reduction in Force	0	1	0	3/4	7
Discharged	0	1	0	1/2	0
Deceased	3	2	2	3	3
Retired	8	7	7	11	7
Military Induction	2	3	1	1	1
Transfers Out	48	7	2	18	8
Disabilities	4	5	3	1	3
Total	133	54	61	70	59
Rehires & Reinstatements	13	34	23	26	20
New Hires	46	45	57	48	39
Transfers In	5	14	9	9	7
Total	64	93	89	83	66

a Quarterly Average

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predicting process gas outleakage behavior, and to identify the degree of contamination which might result from such an outleakage.

#### Corrosive Gas Outleakage Detector

The Pyr-A-Larm fire detector, which is under consideration as a sensor\* to detect accidental  $\text{UF}_6$  outleakage in process cell enclosures, loses sensitivity rapidly when exposed to temperatures above  $175^\circ\text{F}$ , and most units become inoperable when exposed to  $225^\circ\text{F}$  for several hours or more. The major loss of sensitivity results from the reversible effect of heat on a special gas-filled tube in the detector that functions as an amplifier to operate an alarm when outleakage products are present. For this reason, the standard Pyr-A-Larm detector cannot be used reliably to detect  $\text{UF}_6$  outleakage products within cell enclosures if the entire detector is located in the high-temperature environment. To alleviate this problem, an extension kit has been developed to elongate the commercial model (Figure F-20) and separate the outleakage detection section (ionization chambers) from the alarm section (gas-filled tube). This permits the alarm section to be located outside the cell housing in a cooler environment via a hole in the cell wall. Several of these elongated detectors have been laboratory tested, and results indicate that the modification will eliminate this cause of sensitivity loss at elevated temperature. Sensitivity tests indicate that the elongated detector will operate reliably over the temperature range from  $78$  to  $225^\circ\text{F}$  and that it is sensitive to the particulate matter produced in air by the release of gas mixtures containing only  $5$  to  $10$  ppm  $\text{UF}_6$ . A second cause of sensitivity loss at high temperatures is inherent in the ionization chambers but can be counterbalanced by substituting a smaller diameter ion-collecting electrode in the detection chamber. Twelve elongated detectors have been fabricated for evaluation in the  $\text{UF}_6$  outleakage test planned in the K-33 building for next quarter.

#### Corrosive Gas Chromatography: Purge Vent Study

A previous study\*\* at ORGDP has shown the feasibility of applying gas chromatography to the determination of ppm levels of  $\text{UF}_6$  in the purge vent. Present efforts involve a refinement of that study to determine more fully the requirements for automatic process gas chromatography instrumentation, and an extension of the technique to include the determination of chlorine trifluoride-chloryl fluoride (gas pair), and Coolant-114 as well as uranium hexafluoride. The inclusion of the additional gases in an analytical program will aid in the efficient operation of the purge cascade. Present operational needs are met when  $\text{ClF}_3$  and chloryl fluoride are not resolved from one another but are presented as one peak.

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\* K-1802, loc. cit.

\*\* Oak Ridge Gaseous Diffusion Plant Quarterly Report, Fourth Quarter Fiscal Year 1969, April 1, 1969 thru June 20, 1969(U), Union Carbide Corporation Nuclear Division, Oak Ridge Gaseous Diffusion Plant, December 19, 1969 (K-1808) SECRET.

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Limits of detection by corrosive gas chromatography will probably be in the range of 15 - 60 ppm for  $\text{ClF}_3$  +  $\text{ClO}_2\text{F}$ , 10 - 40 ppm for Coolant-114, and 5 - 20 ppm for  $\text{UF}_6$ . The potential interferences with these determinations, from other gases that may occasionally appear in the purge system, are being investigated. The recently revised mobile research automatic chromatograph (Model III-R)\* is being used in this field study.

#### Coolant Inleakage Monitor for Plant Recirculating Water Systems

A continuous instrumental approach has been devised at ORGDP to determine Coolant-114, at ppb levels, in the plant recirculating water systems. The method involves contacting a small, fixed quantity of air with a continuously flowing water sample and measuring the coolant concentration in the air with a nondispersive infrared analyzer. The key to high sensitivity is the extremely large equilibrium distribution coefficient of about 150,000:1, i.e., coolant in air:coolant in water (molar basis at 65°C). Typically at 10.5 molar ppb (100 wt ppb) coolant in water, the equilibrated stationary air sample would contain approximately 1,600,000 molar ppb Coolant-114, an easily measured quantity. Response lag due to equilibration kinetics is expected to be less than 5 minutes, assuming a flow of 1 gal of water per minute and 100 cc of air to be equilibrated.

A distribution coefficient of 146,000:1 was calculated by applying Henry's Law to published solubility data\*\*, and was experimentally verified by mass spectrometric analysis of a contacted air sample obtained at the K-29 main return water header. In that experiment 400,000 molar ppb coolant was found in the air sample as compared to 2.6 molar ppb (25 wt ppb) in the water, giving a distribution coefficient of 154,000:1.

Potentially, the new monitor will reduce analytical costs and provide a prompt indication of prevailing or developing leaks.

#### Long-Radius Elbow Trimmer Valve Test

The Trimmer Valve was conceived in the effort to reduce fixed pressure losses in the diffusion cascade caused by the conventional stage butterfly control valve vane. Because the vane in the conventional valve is somewhat larger than necessary to provide the control required, because it does not open completely, and because it presents a large profile to the flowing stream, a significant fixed power loss results. The Trimmer Valve vane area is considerably less than the cross-sectional area of the pipe in which it is installed. Made of thin plate, its profile is the least possible and produces a minimum pressure drop in the fully open position. In mitered elbows where turning vanes are required, it can replace the central fixed vane and, thus, offers little more resistance than the turning vane it replaced.

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\*K-1810, loc. cit.

\*\**Technical Bulletin B2*, E. I. du Pont de Nemours and Company, Inc., Wilmington, Delaware (1966).

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\$15,000 per cell for each 1 mill/kwhr increase in power cost. The effect of capital escalation is a decrease in the net annual savings of about \$3,000 per cell for each percent increase in annual escalation factor. With 4% capital escalation and 5.5 mills/kwhr power, the predicted net return from power recovery is about \$26,000 per cell per year.

Calculations are currently being made to estimate the sensitivity of power recovery economics to changes in other important parameters, such as stage temperature and gas cooler costs. Results of these calculations will be reported in the near future.

#### CONCENTRATION OF TOXIC FLUORIDE IN THE ATMOSPHERE

The release of toxic fluoride to the atmosphere is of concern in the operation of gaseous diffusion cascades. A study was initiated in February 1970 to examine the average concentration of toxic fluoride at several locations in the vicinity of the Oak Ridge Gaseous Diffusion Plant. The four primary collection sites selected were between 5,000 and 6,000 ft distant and located roughly east, west, north, and south of the purge cascade at K-311-1. Since September 1, 1970, samples have been collected at a fifth site beside the K-25 Credit Union building about 4.7 mi east of K-311-1. Samples were collected at the east and west locations only from February 10 to April 18, 1970 and at all the primary sites since April 18. Each sample collected covers about a 24-hr period. The analysis has an estimated precision of 0.2 ppb fluoride with a lower limit of detection of about 0.2 ppb fluoride. Table F-23 gives the frequency of sampling, the location of the collecting stations and their approximate distance and direction from K-311-1 which is the major source of toxic fluoride contaminants from the cascade. Table F-24 gives the atmospheric concentration of toxic fluoride at the various locations for the sampling periods employed and the average value for all locations during each of the selected periods.

Samples collected at the four 1-mi distant stations between June 17 and July 29 averaged 0.50 ppb F<sup>-</sup> as compared to the average value of 0.55 ppb F<sup>-</sup> obtained at these stations between April 18 and June 17. Samples collected between August 15 and September 10 at these four sites averaged 1.0 ppb F<sup>-</sup> while the few samples collected at the K-25 Credit Union location have averaged 0.8 ppb F<sup>-</sup>. While there is no significant change in the average atmospheric concentration of toxic fluorides at the one-mile distant sampling stations between the initiation of the study and July 29, 1970, there does seem to be an increase in the average fluoride concentration during the period beginning with August 15, 1970 and continuing through September 10, 1970. This is also seen in the fact that during the period of February 10, 1970 through July 29, 1970 only 17 out of 201 samples collected exceeded 1 ppb F<sup>-</sup> whereas 11 out of 35 samples collected since August 15, 1970 have exceeded 1 ppb F<sup>-</sup>. However, at no time at any of the established sampling stations is there any indication that the proposed limits on atmospheric fluorides prepared by the Division of Air Pollution Control of the Tennessee Department of Public Health have been exceeded. Table F-25 shows the limits adopted by the Tennessee Air Pollution Control Board effective August 9, 1969.

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Studies are in progress attempting to correlate deviations in the daily concentrations at the various locations with variables such as wind direction and velocity.

Sampling is being continued at the five collection sites at about a 30% frequency. Samples at all five stations are taken simultaneously.

TABLE F-23

FREQUENCY OF SAMPLING AND DISTANCE AND DIRECTION  
OF COLLECTION STATIONS FROM A MAJOR SOURCE

Collecting Station Location	% of Time Samples Collected During Period				Distance From K-311-1* ft
	2/10-4/18	4/18-6/16	6/17-7/29	8/15-9/10	
K-901 Pump House	49	32	33	31	5100 W
K-1206-D Trailer	51	32	33	31	5000 E
K-805 Radio Tower	0	30	33	31	5200 S
Blair Road Safety Sign	0	30	33	31	6000 N
K-25 Credit Union	0	0	0	**	25000 E

\* A major source of release of toxic fluoride contaminants from the cascade.

\*\* Sampled 3 times between 9/1/70 and 9/10/70.

TABLE F-24

ATMOSPHERIC CONCENTRATION OF TOXIC FLUORIDE

Collection Station Location	Average Toxic Fluoride Concentration During Given Period, ppb F <sup>-</sup> (as HF by volume)			
	2/10-4/18	4/18-6/16	6/17-7/29	8/15-9/10
K-901 Pump House	0.58	0.48	0.59	0.82
K-1206-D Trailer	0.70	0.50	0.56	0.76
K-805 Radio Tower	--	0.69	0.50	1.4
Blair Road Safety Sign	--	0.54	0.35	1.1
K-25 Credit Union	--	--	--	0.80*
Mean of All Sampled Locations	0.64	0.55	0.50	1.0

\* Samples collected between 9/1/70 and 9/10/70.

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TABLE F-25  
AMBIENT AIR QUALITY STANDARD FOR FLUORIDES

<u>Averaging Interval</u>	<u>Fluoride Concentration as HF, ppb by volume</u>
12 hours	4.5
24 hours	3.5
7 days	2.0
30 days	1.5

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## DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room